

***What Is Claimed Is:***

1. An audio conference server (ACS) for enabling an application program to provide multi-point, weight controllable audio conferencing, comprising:  
means for managing at least one audio conference, said at least one audio conference comprising a plurality of audio clients;  
means for receiving audio data from said plurality of audio clients;  
means for mixing said audio data to provide spatialized audio to said plurality of audio clients in said at least one audio conference, wherein said mixing means results in mixed audio data; and  
means for delivering said mixed audio data to said plurality of audio clients in said at least one audio conference.

2. The ACS of claim 1, wherein said mixing means includes means for providing distance-based attenuation according to sound decay characteristics.

3. The ACS of claim 1, further comprising means for checking the status of a registered owner of said at least one audio conference to determine whether said at least one audio conference still exists.

4. The ACS of claim 3, wherein said checking means includes a resource audit service, said resource audit service operable when said at least one audio conference is generated by a first application and is being used by a second application.

5. The ACS of claim 1, wherein said plurality of audio clients includes set-top box (STB) audio clients and point source audio (PSA) audio clients.

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1 6. The ACS of claim 1, wherein said managing means comprises an ACS  
2 shell to allow a user to interactively interface with said ACS, said ACS shell  
3 including:

4 means for providing program access to high level methods for creating  
5 and managing a proxy audio conference;

6 means for providing program access to methods for creating and  
7 managing a plurality of PSA audio clients; and

8 means for providing program access to low level methods for creating  
9 and managing said at least one audio conference.

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2 7. The ACS of claim 2, wherein said means for providing distance-based  
3 attenuation according to sound decay characteristics comprises:

4 means for identifying a decay factor from one of a plurality of pre-  
5 defined decay factors and a customized decay factor for each of said plurality  
6 of audio clients, said plurality of pre-defined decay factors including

7 an audio big decay factor,  
8 an audio small decay factor,  
9 an audio medium decay factor, and  
10 a constant decay factor;

11 means for determining distances between a target audio client and a  
12 plurality of source audio clients;

13 means for determining a plurality of weighted values for each of said  
14 source audio clients based on said identified decay factor and said distance  
15 between each of said source audio clients and said target audio client, wherein  
16 each of said weighted values corresponds to a source/target audio client pair;

17 means for generating a mix table for each of said source/target audio  
18 client pairs;

means for calculating an actual mix for said target audio clients; and

19 ~~means for refining said actual mix for said target audio clients.~~

1 <sup>7</sup>  
2 ~~8.~~ The ACS of claim <sup>6</sup>~~7~~, wherein said refining means comprises:  
3 a gain control function to avoid transmitting excess energy audio data;  
4 a fade in/fade out function to avoid the delivery of said audio data in a  
5 step-wise manner to a speaker output;  
6 a floating point operation elimination function to avoid the performance  
7 of floating point multiplication;  
8 a mixing adaption function to adapt the actual mix calculation for said  
9 target audio client to available CPU resources;  
10 a mixing cut-off function to select the nearest talking audio clients for  
11 the actual mix; and  
12 a stream audio function to prepare stream audio for playing ambient  
13 background music or using an audio source forwarded from another  
conference.

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1 10. The method of claim 9, wherein said mixing step includes providing  
2 distance-based attenuation according to sound decay characteristics.

1 Sub 11. The method of claim 9, further comprising the step of checking the  
2 status of a registered owner of said at least one audio conference to determine  
3 whether said at least one audio conference still exists.

1 12. The method of claim 11, wherein said checking step includes a resource  
2 audit service, said resource audit service operable when said at least one audio  
3 conference is generated by a first application and is being used by a second  
4 application.

1 11 13. The method of claim 8, wherein said plurality of audio clients includes  
2 set-top box (STB) audio clients and point source audio (PSA) audio clients.

1 14. The method of claim 9, wherein step (1) comprises the step of providing  
2 program access to high level methods for creating and managing a proxy audio  
3 conference using an ACS shell.

1 15. The method of claim 9, wherein step (1) comprises the step of providing  
2 program access to methods for creating and managing said point source audio  
3 using an ACS shell.

1 16. The method of claim 9, wherein step (1) comprises the step of providing  
2 program access to low level methods for creating and managing said at least  
3 one audio conference using an ACS shell.

1 18. A computer program product comprising a computer useable medium  
2 having computer program logic recorded thereon for enabling an audio  
3 conference server (ACS) to provide an application program with multi-point,  
4 weight controllable audio conferencing, said computer program logic  
5 comprising:

6 means for enabling the computer to manage at least one audio  
7 conference, said at least one audio conference comprising a plurality of audio  
8 clients;

9 means for enabling the computer to receive audio data from said  
10 plurality of audio clients;

11 means for enabling the computer to mix said audio data to provide  
12 spatialized audio to said plurality of audio clients in said at least one audio  
13 conferences, wherein said mixing means results in mixed audio data; and

14 means for enabling the computer to deliver said mixed audio data to said  
15 plurality of audio clients in said at least one audio conference.

1 19. The computer program product of claim 18, wherein said means for  
2 enabling the computer to mix said audio data to provide spatialized audio to  
3 said plurality of audio clients in said at least one audio conference includes  
4 means for enabling the computer to provide distance-based attenuation  
5 according to sound decay characteristics.

1 20. The computer program product of claim 18, further comprising means  
2 for enabling the computer to check the status of a registered owner of said at  
3 least one audio conference to determine whether said at least one audio  
4 conference still exists.

18  
1 ~~21.~~ The computer program product of claim ~~20~~<sup>17</sup>, wherein said means for  
2 enabling the computer to check the status of a registered owner of said at least  
3 one audio conference includes a resource audit service, said resource audit  
4 service operable when said at least one audio conference is generated by a first  
5 application is being used by a second application.

19  
1 ~~22.~~ The computer program product of claim ~~18~~<sup>16</sup>, wherein said plurality of  
2 audio clients includes set-top box (STB) audio clients and point source audio  
3 (PSA) audio clients.

20  
1 ~~23.~~ The computer program product of claim ~~18~~<sup>16</sup>, wherein said means for  
2 enabling the computer to manage at least one audio conference comprises  
3 means for enabling the computer to provide an ACS shell to allow a user to  
4 interactively interface with said ACS, said ACS shell including:  
5 means for enabling the computer to provide program access to high  
6 level methods for creating and managing a proxy audio conference;  
7 means for enabling the computer to provide program access to methods  
8 for creating and managing a plurality of point source audio (PSA) audio clients;  
9 and  
10 means for enabling the computer to provide program access to low level  
11 methods for creating and managing said at least one audio conference.

21  
1 24. The computer program product of claim 19, wherein said means for  
2 enabling the computer to provide distance-based attenuation according to sound  
3 decay characteristics comprises:  
4 means for enabling the computer to identify a decay factor from one of  
5 a plurality of pre-defined decay factors and a customized decay factor for each

6 of said plurality of audio clients, said plurality of pre-defined decay factors  
7 including

- 8 an audio big decay factor,
- 9 an audio small decay factor,
- 10 an audio medium decay factor, and
- 11 a constant decay factor;

12 means for enabling the computer to determine distances between a target  
13 audio client and a plurality of source audio clients;

14 means for enabling the computer to determine a plurality of weighted  
15 values for each of said source audio clients based on said identified decay factor  
16 and said distance between said source audio client and said target audio client,  
17 wherein each of said weighted values corresponds to a source/target audio  
18 client pair;

19 means for enabling the computer to generate a mix table for each of said  
20 source/target audio client pairs;

21 means for enabling the computer to calculate an actual mix for said  
22 source audio clients; and

23 means for enabling the computer to refine said actual mix for said  
24 source audio clients.

22  
25. The computer program product of claim <sup>21</sup>24, wherein said means for  
2 enabling the computer to refine said actual mix for said source audio clients  
3 comprises:

4 means for enabling the computer to provide a gain control function to  
5 avoid transmitting excess energy audio data;

6 means for enabling the computer to provide a fade in/fade out function  
7 to avoid the delivery of said audio data in a step-wise manner to a speaker  
8 output;

9 means for enabling the computer to provide a floating point operation  
10 elimination function to avoid the performance of floating point multiplication;

11 means for enabling the computer to provide a mixing adaption function  
12 to adapt the actual mix calculation for said target audio client to available CPU  
13 resources;

14 means for enabling the computer to provide a mixing cut-off function  
15 to select the nearest talking audio clients for the actual mix; and

16 means for enabling the computer to provide a stream audio function to  
17 prepare stream audio for playing ambient background music or using an audio  
18 source forwarded from another conference.

add 23



1 17. The method of claim 10, wherein said step for providing distance-based  
2 attenuation according to sound decay characteristics comprises the steps of:  
3 identifying a decay factor from one of a plurality of pre-defined decay  
4 factors and a customized decay factor for each of said plurality of audio clients,  
5 said plurality of pre-defined decay factors including  
6 an audio big decay factor,  
7 an audio small decay factor,  
8 an audio medium decay factor, and  
9 a constant decay factor;  
10 determining distances between a target audio client and a plurality of  
11 source audio clients;  
12 determining a plurality of weighted values for each of said source audio  
13 clients based on said identified decay factor and said distance between each of  
14 said source audio client and said target audio client, wherein each of said  
15 weighted values corresponds to a source/target audio client pair;  
16 generating a mix table for each of said source/target audio client pairs;  
17 calculating an actual mix for said target audio clients using said mix  
18 table; and  
19 refining said actual mix for said target audio clients, wherein said  
20 refining step is used to avoid transmitting excess energy audio data, avoid the  
21 delivery of said audio data in a step-wise manner to a speaker output, avoid the  
22 performance of floating point multiplication, adapt the actual mix calculation  
23 for said target audio client to available CPU resources, select the nearest talking  
24 audio clients for the actual mix, and prepare stream audio for playing ambient  
25 background music or using an audio source forwarded from another  
26 conference.